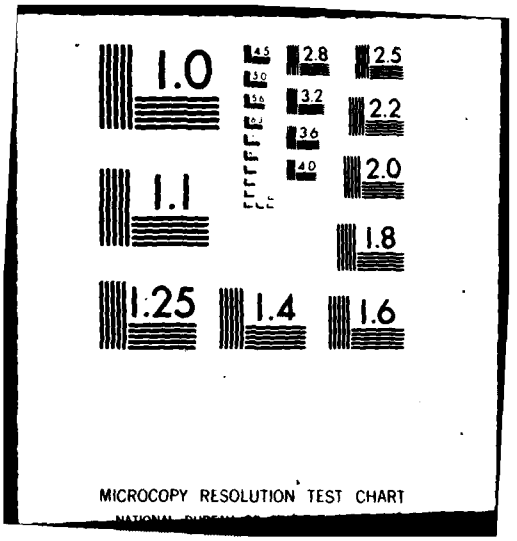
AD-A111 897 ARKANSAS UNIV LITTLE ROCK F/G 6/19
PHYSIOLOGICAL STUDIES OF HEAT STRESS ACCLIMATION DURING A SPECI--ETC(U)
OCT 81 L F MORGANS AFOSR-81-0098
UNCLASSIFIED AFOSR-TR-82-0091 NL

END
DATE FILMED
4-82
DTIC


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
5.6
6.3
MICROCOPY RESOLUTION TEST CHART

13

AFOSR [redacted] 81-0098
Final Technical Report
October 1981

PHYSIOLOGICAL STUDIES OF HEAT STRESS ACCLIMATION DURING A SPECIFIC EXERCISE REGIMEN

UNIVERSITY OF ARKANSAS
LITTLE ROCK, AR 72204

Dr. Morgans

Controlling Office: USAF Office of Scientific Research/NL
Bolling Air Force Base, DC 20332

Body of the Final Report

I. A comprehensive list of the research objectives

The primary objectives of this study were to measure (1) core temperature, (2) skin temperature, and (3) sweat production of subjects while they were involved in the exercise regimen of racquetball in order to determine whether or not that sport can act as a heat acclimator by producing a high level of hyperthermia.

II. Status of the research

All of the research objectives were completed during this past summer. A total of eleven subjects were used in this study. The results were used in this study. The results are summarized as follows:

(1) There was a significant increase in core temperature (rectal) during an hour of racquetball play (Table 1). Rectal temperatures increased from 37.6° at the beginning of the hour to 39.0° at the end of the hour. Thus, the exercise regimen of racquetball had a significant hyperthermic effect. ($P < .001$).

(2) There was a significant decrease in skin temperature ($P < 0.025$) during an hour of racquetball play (Table 2). Skin temperature fell from 32.6° at the beginning of the hour to 31.1° at the end of the hour. The core hyperthermia thus produced a sweating response which in turn had a cooling effect on the skin.

(3) An hour of racquetball caused a high level of sweating (Table 3). The average subject secreted 1.58 mg/cm^2/min of sweat during the hour.

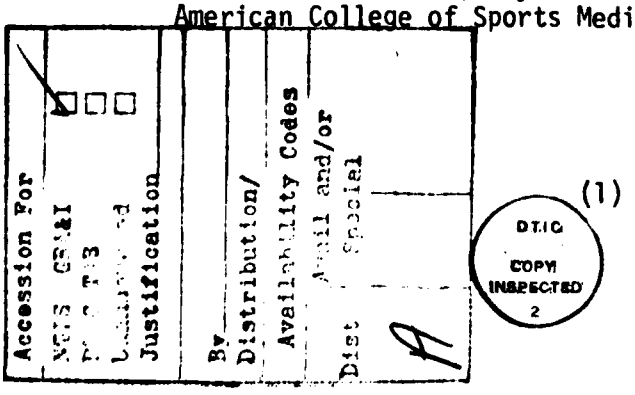
(4) There were weight losses during a hour of racquetball play (Table 3). The average subject lost 1.21 kg., or 1.53% of his total body weight, during the hour.

III. A cumulative chronological list of written publications in technical journals.

Since the data for this project was collected during this past summer, the results are not yet in press. The article has been sent to the Journal of Applied Physiology.

IV. Coupling activities - spoken papers presented at meetings and seminars

This paper will be presented at the annual meeting of the American Alliance for Health, Physical Education, Recreation and Dance, the American College of Sports Medicine, or the Federation meetings.



(1)

V. Applications stemming from the research effort

The primary application derived from this research effort was that the exercise regimen of racquetball has been shown to be a good heat stress acclimator by virtue of the finding that it produces a significantly high level of hyperthermia.

Table 1. Core temperature responses of subjects while they played racquetball for one hour

	Time-minutes						
Subjects	0	10	20	30	40	50	60
1	37.4	38.2	38.6	38.7	38.8	38.8	38.8
2	37.9	38.4	38.7	38.8	39.0	39.1	39.3
3	37.4	37.7	38.2	38.7	38.9	39.0	39.2
4	38.0	38.5	38.9	39.3	39.4	39.5	39.5
5	37.8	38.4	38.5	38.6	38.7	38.6	38.8
6	37.7	38.0	38.3	38.8	38.9	38.9	38.9
7	38.0	38.1	38.4	38.7	39.0	39.1	39.1
8	37.6	37.7	38.3	38.7	39.0	39.3	39.5
9	37.4	38.0	38.3	38.4	38.4	38.5	38.6
10	37.6	38.3	38.6	38.9	39.2	39.3	39.5
11	37.2	37.4	37.7	37.9	38.0	38.1	38.1
*$\bar{X} \pm$ SD	37.6 $\pm$ 0.26	38.1 $\pm$ 0.33	38.4 $\pm$ 0.30	38.7 $\pm$ 0.32	38.8 $\pm$ 0.36	38.9 $\pm$ 0.39	39.0 $\pm$ 0.42

*$\bar{X} \pm$ SD = mean $\pm$ standard deviation

Table 2. Skin temperature response of subjects while they played racquetball for one hour.

	Time-minutes						
Subjects	0	10	20	30	40	50	60
1	33.4	31.6	32.3	31.8	31.8	31.8	31.1
2	31.7	31.9	30.3	29.1	34.0	33.9	33.5
3	33.6	30.5	28.8	30.5	31.2	29.5	31.1
4	32.4	31.8	32.4	33.3	33.5	32.1	31.2
5	32.9	31.6	33.2	33.7	33.8	32.7	33.2
6	32.4	32.8	31.5	31.8	31.2	29.4	29.6
7	32.6	32.1	30.5	31.0	32.9	31.0	29.7
8	31.3	30.1	30.4	29.4	32.5	31.6	29.6
9	**ND						
10	33.0	31.7	30.9	31.5	31.4	30.8	31.3
11	33.1	32.1	31.5	30.7	30.1	31.6	31.0
*$\bar{X} \pm$ SD	32.6 $\pm$ 0.69	31.6 $\pm$ 0.74	31.2 $\pm$ 1.21	31.3 $\pm$ 1.41	32.2 $\pm$ 1.24	31.4 $\pm$ 1.30	31.1 $\pm$ 1.29

*$\bar{X} \pm$ SD = mean $\pm$ standard deviation
** ND = no data

Table 3. Sweat rates and weight losses of subjects while they played racquetball for one hour.

Subjects	Sweat rates ($mg/cm^2/min$)	Weight Loss (kg)
1	1.77	**ND
2	1.32	0.91
3	2.03	1.70
4	1.73	2.04
5	1.56	1.36
6	1.49	1.07
7	1.39	1.02
8	2.00	0.91
9	1.29	0.79
10	1.90	1.59
11	0.95	0.68
*$\bar{X} \pm$ SD	1.58 ± 0.32	1.21 ± 0.42

* $\bar{X} \pm$ SD = mean $\pm$ standard deviation
** ND = no data

REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER **AFOSR-TR- 82-0091** 2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) PHYSIOLOGICAL STUDIES OF HEAT STRESS ACCLIMATION DURING A SPECIFIC EXERCISE REGIMEN	5. TYPE OF REPORT & PERIOD COVERED Final Report
	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Leland F. Morgans	8. CONTRACT OR GRANT NUMBER(s) AFOSR-81-0098
9. PERFORMING ORGANIZATION NAME AND ADDRESS University of Arkansas at Little Rock 33rd and University Ave. Little Rock, AR 72204	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 61102F 2312/D9
11. CONTROLLING OFFICE NAME AND ADDRESS Air Force Office of Scientific Research/NL Bolling AFB DC 20332	12. REPORT DATE October 20, 1981
	13. NUMBER OF PAGES 5
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)	15. SECURITY CLASS. (of this report) UNCLASSIFIED
	15a. DECLASSIFICATION DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

To be sent to the Journal of Applied Physiology for possible publication

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

exercise regimen, racquetball, heat stress acclimator, core temperature, skin temperature, sweat rate, weight loss

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Eleven subjects were used to determine the effects of racquetball on core temperature, skin temperature, sweat production, and weight loss. The results indicated that an hour of racquetball play produced a significant increase in core temperature, a significant decrease in skin temperature, a high level of sweating and a weight loss. It was concluded that the exercise regimen of racquetball can act as a good heat stress acclimator by virtue of finding that it produced a significantly high level of hyperthermia.

DD FORM 1 JAN 73 1473

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)


DATE
ILME